

CLAIMS

1. A synthetic resin molding mold comprising a mold base(1), a cavity block(2) having a cavity(3) provided within the mold base(1), a heat insulating layer(5) provided between the mold base(1) and the cavity block(2), and a channel(A) provided near a cavity surface(4) through which a heating medium and a cooling medium are alternately and repeatedly supplied, wherein a space(t1) is provided at a contact portion between the cavity block(2) and the mold base(1) based on the anticipation of a thermal expansion of the cavity block(2).

2. The synthetic resin molding mold according to claim 1, wherein the space(t1) is set so that a thermal stress caused when the cavity block(2) is expanded becomes equal to or smaller than 200MPa.

3. The synthetic resin molding mold according to claim 1, wherein a fixing portion with a gap(t2) smaller than the space(t1) is provided between the cavity block(2) and the mold base(1).

4. The synthetic resin molding mold according to claim 3, wherein the gap(t2) of the fixing portion is set to be in a range of from 1 to 30 μ m.

5. The synthetic resin molding mold according to

claim 1, wherein a surface of the cavity block(2) is larger than a surface(4) of the cavity(3).

6. The synthetic resin molding mold according to claim 1, wherein the heating medium is steam.

7. The synthetic resin molding mold according to claim 1, wherein a channel(A1) through which cooling medium is constantly supplied is provided in addition to the channel(A) .

8. The synthetic resin molding mold according to claim 1, wherein the cavity block(2) is composed of a stationary mold half and a movable mold half, and at least one of the stationary mold half and the movable mold half is provided with the channel(A) .

9. The synthetic resin molding mold according to claim 1, wherein the cavity(3) is arranged as a cubic body having a bottom wall surface and a side wall surface, two groups of the channel in which the channels(A) are arrayed at a pitch(P) and through which the heating medium and the cooling medium are alternately and repeatedly supplied, are separately provided near the bottom wall surface and the side wall surface of the cavity(3), and the distance(Pa) from the nearest passage of one channel group to the nearest passage of the other channel group is made smaller

than the pitch(p) at which the channels(A) are arrayed in each channel group.

10. The synthetic resin molding mold according to claim 1, wherein the cavity(3) is arranged as a cubic body having a bottom wall surface and a side wall surface, two groups of the channel in which the channels(A) are arrayed at a pitch(p) and through which the heating medium and the cooling medium are alternately and repeatedly supplied, are separately provided near the bottom wall surface and the side wall surface of the cavity(3), the distance(Pa) from the nearest channel of one channel group to the nearest channel of the other channel group is larger than the pitch (p) at which the channels(A) are arrayed in each channel group, and a channel(A2) is additionally provided at an intersection or inside of the intersection of the array of the channels(A) along the bottom wall surface and the array of the channels(A) along the side wall surface of the cubic cavity(3).

11. The synthetic resin molding mold according to claim 1, wherein the channel(A) through which the heating medium and the cooling medium are alternately and repeatedly supplied is made to have a hydraulic equivalent diameter of 3 to 6mm, and a distance(h) from a cavity surface(4) to a channel surface is set to 1 to 10mm.

12. The synthetic resin molding mold according to claim 1, wherein the cavity block(2) has provided therein inlet and outlet slots(15,16) communicating with the channel(A), and the inlet and outlet slots(15,16) are attached with conduits(17) thermally insulated from the mold base(1).

13. The synthetic resin molding mold according to claim 12, wherein a hydraulic equivalent diameter of the slot(15,16) is set to one to three times the hydraulic equivalent diameter of the channel (A).

14. The synthetic resin molding mold according to claim 12, wherein the cavity block(2) is divided into a part having provided therein the channel(A) and a part having the slot(15,16) provided, and a medium sealing member is provided at a face dividing the cavity block(2) into two parts.

15. The synthetic resin molding mold according to claim 14, wherein the medium sealing member is formed of an adhesive agent.

16. A product molded by the synthetic resin molding mold according to claim 1 or 12.

17. A method of molding a synthetic resin comprising

the steps of:

injecting a thermoplastic resin into the mold according
to claim ~~1~~ or 12;

injecting a thermosetting resin into the mold to coat the
thermoplastic resin at the surface thereof with the
thermosetting resin;

supplying a heating medium into the channel(A) to cure
the thermosetting resin; and

supplying a cooling medium into the channel(A) to cool
the thermoplastic resin.

18. An apparatus for adjusting a temperature of the
synthetic resin molding mold according to claim ~~1~~ or 12,
wherein an inlet switching valve(Sa, Wa, Aa, Sb, Wb, Ab)
and an outlet switching valve(Ds4, Ds5, WRa, WRb) are
provided for selecting the supply of a heating medium and a
cooling medium at an upstream inlet and a downstream outlet
of the channel(A), and at least one exhaust valve(Ds2, Ds3,)
for discharging the heating medium, cooling medium and a
gas is provided in the flow passage at a portion between
the inlet switching valve(Sa, Wa, Aa, Sb, Wb, Ab) and the
outlet switching valve(Ds4, Ds5, WRa, WRb).

19. The apparatus according to claim 18, wherein at
least one inlet valve through which a purging gas is
supplied is provided in the fluid passage at the portion
between the inlet switching valve(Sa, Wa, Aa, Sb, Wb, Ab)

and the outlet switching valve(Ds4, Ds5, WRa, WRb).

20. The apparatus according to claim 18, wherein a check valve(c) is provided on the downstream side of the inlet switching valve(Sa, Sb) for the heating medium.

21. A method of adjusting a temperature of the synthetic resin molding mold according to claim ~~18~~ 12, the method comprising a step of supplying a heating medium and a cooling medium into the channel(A) alternately and repeatedly so as to heat and cool the surface(4) of the cavity(3), wherein when the medium supply is changed from the cooling medium to the heating medium, at least one of the exhaust valves(Ds2,Ds3) provided on the upstream side and the downstream side of the channel(A) is opened and the cooling medium left within the channel is discharged by a gas or the heating medium.

22. The method according to claim 21, wherein when the medium supply is changed from the heating medium to the cooling medium, a purging gas is supplied into the channel.

23. The method according to claim 21, wherein the supply of the heating medium starts at a timing point between the opening of the mold to the ejection of a molded product.

24. The method according to claim 23, wherein the mold is not closed until a predetermined time period has elapsed after the heating medium supply is started.

25. The method according to claim 23, wherein the mold is not closed until the heating medium is supplied to heat a surface(4) of the cavity(3) or complete the heating of the surface(4) of the cavity(3) up to a predetermined temperature.

26. The method according to claim 21, wherein the heating medium is steam.